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L1: Entry 2 of 4

File: USPT

Dec 12, 2000

US-PAT-NO: 6159414

DOCUMENT-IDENTIFIER: US 6159414 A

TITLE: Large composite core structures formed by vacuum assisted resin transfer molding

DATE-ISSUED: December 12, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tunis, III; George C.	Wilmington	DE		
Winckler; Steven J.	Troy	NY		

US-CL-CURRENT: 264/510; 257/258, 257/511, 257/571

ABSTRACT:

Large composite structures are produced using a vacuum assisted resin transfer molding process. The structures incorporate cores, which may be hollow cells or foam blocks. A plurality of cores, each of which may be wrapped with a fiber material, is arranged in a layer on a mold with a fiber material arranged to form face skins. The assembly is sealed under a vacuum bag to a mold surface. One or more main feeder conduits are provided in communication with a resin distribution network of smaller channels which facilitates flow of uncured resin into and through the fiber material. The resin distribution network may comprise a network of grooves formed in the surfaces or the cores and/or rounded corners of the cores. The network of smaller channels may also be provided between the vacuum bag and the fiber material, either integrally in the vacuum bag or via a separate distribution medium. Resin, introduced under vacuum, travels relatively quickly through the main feeder channel(s) and the network of smaller channels. After penetrating the fiber material to reach the surface of the cores, the resin again travels relatively quickly along the cores via the grooves in the cores or the spaces provided by the rounded corners to penetrate the fiber material between the cores, if present, and between the cores and the mold.

26 Claims, 27 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

Full	Title	Citation	Front	Review	Classification	Date	References	Sequences	Attachments	Claims	RQMC	Draw Desc	Image
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 3. Document ID: US 6117519 A

L1: Entry 3 of 4

File: USPT

Sep 12, 2000

US-PAT-NO: 6117519

DOCUMENT-IDENTIFIER: US 6117519 A

TITLE: Composite core material, composite material and method of assembly

DATE-ISSUED: September 12, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Burns; Mark L.	Ocean Springs	MS	39564	

US-CL-CURRENT: 428/116; 428/118, 428/72, 428/73, 428/77, 52/309.1, 52/309.15,
52/793.1

ABSTRACT:

A composite material having a core between the layers of reinforcing material that is formed from a plurality of separate and independent cells that are not physically linked to each other as is common with honeycomb structures or cores. Each cell is hollow and is preferably hexagonal in shape. The composite material is formed by placing one or more layers of the first side of the reinforcing material on the mold surface. Said core is then placed on the reinforcing and one or more layers of the second side of the reinforcing material is then placed on top of the core. An inner mold or vacuum bag, depending upon the application and type of reinforcing material, is placed upon the second side of the reinforcing material. Resin or bonding material is then distributed directly into the area of the cells between the two sides of reinforcing material. The channels or canals defined by the space between the core cells become the resin distribution network, thus allowing the resin or bonding to spread throughout the core and saturate the reinforcing material on each side of the cells.

30 Claims, 16 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

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4. Document ID: US 5904972 A

L1: Entry 4 of 4

File: USPT

May 18, 1999

US-PAT-NO: 5904972

DOCUMENT-IDENTIFIER: US 5904972 A

TITLE: Large composite core structures formed by vacuum assisted resin transfer molding

DATE-ISSUED: May 18, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tunis, III; George C.	Wilmington	DE		
Winckler; Steven J.	Troy	NY		

US-CL-CURRENT: 428/178; 428/118, 428/188, 428/72, 52/793.1

ABSTRACT:

Large composite structures are produced using a vacuum assisted resin transfer molding process. The structures incorporate cores, which may be hollow cells or foam blocks. A plurality of cores, each of which may be wrapped with a fiber material, is arranged in a layer on a mold with a fiber material arranged to form face skins. The assembly is sealed under a vacuum bag to a mold surface. One or more main feeder conduits are provided in communication with a resin distribution network of smaller channels which facilitates flow of uncured resin into and through the fiber material. The resin distribution network may comprise a network of grooves formed in the surfaces of the cores and/or rounded corners of the cores. The network of smaller channels may also be provided between the vacuum bag and the fiber material, either integrally in the vacuum bag or via a separate distribution medium. Resin,

introduced under vacuum, travels relatively quickly through the main feeder channel(s) and the network of smaller channels. After penetrating the fiber material to reach the surface of the cores, the resin again travels relatively quickly along the cores via the grooves in the cores or the spaces provided by the rounded corners to penetrate the fiber material between the cores, if present, and between the cores and the mold.

15 Claims, 27 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

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L1: Entry 1 of 4

File: USPT

Apr 9, 2002

US-PAT-NO: 6367406

DOCUMENT-IDENTIFIER: US 6367406 B1

TITLE: Boat and method for manufacturing using resin transfer molding

DATE-ISSUED: April 9, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sahr; Ronald C.	Randall	MN		
Nelson; Michael D.	Little Falls	MN		
Retka; Robert L.	Long Prairie	MN		

US-CL-CURRENT: 114/357

ABSTRACT:

One aspect of the present invention relates to a method for making a boat. The boat includes a port side positioned opposite from a starboard side. The boat also includes a floor and stingers supports positioned within the hull. The method includes providing a insert having two spaced-apart elongated portions interconnected by at least two spaced-apart transverse portions that extend between the elongated portions. The elongated portions are sized and relatively positioned for one of the elongated portions to extend along the port side of the hull and the other of the elongated portions to extend along the starboard side of the hull. The method also includes positioning the insert in a chamber defined between a male mold piece and a female mold piece. The method further includes providing fibrous reinforcing material that surrounds the insert within the chamber. The fibrous reinforcing material includes portions positioned between the male mold piece and the insert, and also includes portions positioned between the female mold piece and the insert. The method further includes transferring resin into the chamber between the male and female mold pieces such that the resin envelops the fibrous reinforcing material, and curing the resin within the chamber. As the resin cures, the resin enveloped fibrous reinforcing material hardens to form the hull, the floor and the support stringers of the boat.

7 Claims, 6 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

 2. Document ID: US 6159414 A